

PROJECT TITLE

**PURCHASE OF 315MMØ SIZES OF PVC-O PIPES, FIXED SEAL**

OWNER

**GENERAL SANTOS CITY WATER DISTRICT**

**ABC: P 8,160,000.00**

**TECHNICAL SPECIFICATIONS**

**GENERAL SCOPE**

This section specifies the requirements for **ORIENTED UNPLASTICIZED POLYVINYL CHLORIDE (PVC-O)** pipes **fixed seal type**. The material from which the pipes are made shall be made of Oriented Unplasticized Polyvinyl Chloride Compound and Formulation. This compound and formulation shall consist substantially of Polyvinyl Chloride (PVC-U) resin or powder, to which shall consist those additives necessary to facilitate the production of pipes and fittings, Class 500 PN16 (1.6 MPa) 230 psi in accordance with the requirements for Oriented Unplasticized Polyvinyl Chloride (uPVC-o) pipes with nominal outside diameter of 315mm intended for the conveyance of potable water under pressure and temperatures up to 45°C for use below ground. The Pipe shall conform to the requirements of the Philippines National Standard Specification, Oriented Unplasticized Polyvinyl Chloride (PVC-O), a type of Unplasticized Polyvinyl Chloride (Upvc) Pipes for Potable Water Supply (PNS 65: 1993)

**A. CLASSIFICATION**

Pipes shall have a material classification of 500 (class 500) with nominal pressure PN16 (1.6 MPa) or 230 psi.

**B. REQUIREMENTS**

**1. Materials**

a. The raw materials must be "Virgin Resin" from a recognized top-quality resin company. In-plant blending of non-compound resins is non-acceptable.

b. The Pipe shall meet the requirements of the National Sanitation Institute of Science and Technology or other approved testing laboratories and shall be made from non-toxic, non-lead-based plasticizer.

c. The use of manufacturer's own reprocessed material, produced during the manufacture and works testing of products and conforming to the material obtained from external sources shall not be used.

d. When measured according to the methods described in ISO 3126 unplasticized polyvinyl chloride pipe shall conform with the following dimensions conforming to the wall thickness table in ISO 16422.

e. The minimum depth of engagement of integral sockets with elastomeric fix sealing ring type joints shall conform to ISO 2045.

## **2. Physical Characteristics**

### **a. Appearance**

The pipe shall be homogeneous throughout and free from cracks, holes encrustations and other foreign inclusions. Excessive die line and/or stress marks (particularly in the socket and bell groove) as well as discernible material marbling are not allowed. The ends of the pipe shall be cleanly cut and square to the axis of the pipe

### **b. Color**

The pipe shall be blue in color extruded from the compound resins that consists of carbon blue (2% minimum) to resist UV penetration and shall be uniform throughout the entire surface of the pipe.

### **c. Pipe Ends**

The Pipes with Plain Ends to be used with elastomeric sealing ring type joints shall have a chamfer conforming top ISO 16422.

### **d. Ovality and Waviness**

The Pipe should be round and should not have wavy inside and outside surface.



e. Weight

The Oriented uPVC pipes should be less than half of ordinary uPVC pipes weight of the same nominal external diameter.

**3. Mechanical Properties**

The Pipe shall conform with the mechanical properties in Mechanical Properties and Characteristics

Table 2- Mechanical Properties and Characteristics

Product Standard	Units	Value (ISO 16422)
Minimum required (MRS)	MPa	50
Overall service coefficient (C)		1.4
Design Stress ( $\sigma$ )	MPa	36
Short term elasticity modulus (E)	MPa	>4,000
Resistance to axial traction	MPa	>48
Resistance to hoop traction	MPa	>85
Shore hardness D		81-85
Density	Kg/ dm <sup>3</sup>	1.35-1.46
PVC Resin K value		>64
Poisson coefficient		0.35-0.41
Vicat temperature	°C	>80
Lineal expansion coefficient	°C <sup>-1</sup>	0.8x10 <sup>-4</sup>
Thermal conductivity	Kcal/ mh °C	0.14-0.18
Specific heat at 20 °C	Cal/ g°C	0.20-0.28
Dielectric stiffness	Kv/ mm	20-40
Dielectric constant at 60 Hz		3.2-3.6
Transverse resistivity at 20 °C	Ω/cm	>1016
Absolute roughness (ka)	Mm	0.007
Absolute roughness (Hazen Williams)		150
Manning roughness coefficient (n)		0.009

The ring stiffness of pipes conforming to this international standard may be determined in accordance with ISO 9969. Pipes of stiffness less than

4KN/m<sup>2</sup> might not be suitable where high vacuum or external pressure could be developed, and could need special installation techniques were installed below ground.

#### **4. Joints**

Polypropylene Ring with a synthetic rubber lip shall be used for size 315mm.

This watertight scaling type of joints includes a polypropylene ring and a synthetic rubber lip which allows the seal to be integrated with the pipe, avoiding joint displacement or movement while the installation is taking place.

#### **5. SAMPLING AND TESTING**

1. At least one piece or set ( depending on the quantities specified by the test method) of sample/s per production batch ( one production run or one production shift, whichever is shorter) shall be taken at random for testing in accordance with the methods and procedure specified in this standard.

2. Pressure testing shall be conducted in accordance with ISO 1167-1

3. Pipes shall be tested at 0°C in accordance with ISO 3127, and shall have true impact rate (TIR) of not more than 10% when using masses given in Table 3 of ISO 16422. The radius of the striker nose shall be R= 12.5mm.

Table 3- Classified striker mass and drop height conditions for the falling weight impact test

Size	Total Mass
Mm	Kg
<b>315</b>	<b>20</b>

#### **6. MARKING**

The pipe shall be clearly marked in white text and shall not exceed 0.15mm deep consisting of but not limited to the following information spaced at intervals of not more than one meter:



1. Name of Product
2. Outside diameter and thickness, mm
3. Pressure Rating
4. Manufacturing's name and/ or its recognized trademark
5. Material Code/ Reference Standard
6. Date of Manufacture
7. The words "For Potable Water"
8. The words "General Santos City Water District" with One (1) inch font size bold marking using laser or inkjet printed
9. Bell insertion marking at spigot end

The pipe manufacturer shall provide certification that all the pipe testing/ characteristic has been performed/ meet on the specific product in accordance with ISO 16422:2014 Minimum required strength (MRS) 50.0P MPa

**Taking of Samples:**

Shall be randomly selected by the GSCWD personnel from the pipes intended for delivery and will be subjected to the following test;

1. Materials, appearance and dimensions.
2. Chemical /Mechanical Test
  - a) SHORT TERM PRESSURE – The pipe and Joints shall withstand the applied pressure for at least Ten (10) hours without failure. The value for the applied pressure test will be 28.9 Bars(2.89MPa)(419Psi) for PN16 PVC-O Pipes. Water tightness of joints shall also be tested with positive and negative pressure with required deflection.
  - b) BURST PRESSURE TEST – Shall maintain a minimum breaking pressure of 38 bar (550 psi)(3.8 Mpa) in a minimum time of 60 Sec at 20°C
  - c) Resistance to Acetone

The pipe shall not show signs of delamination or disintegration when immersed with acetone.

**DELIVERY SCHEDULE**

Within **Sixty (60) Calendar Days** after receipt of the Purchase Order, the total number of pipes, including testing and inspection, is expected. Pipes should be delivered to the following site designated by the General Santos City Water District.

**SPECIAL PROVISION:**

- A pre-delivery testing shall be conducted with the presence of Five (5) representatives from GSCWD within Four (4) days which already include departure and arrival from the purchasing entity at the local warehouse. Cost of inspection such as transportation, meals, allowances, accommodations, and other related expenditures shall be shouldered by the winning bidder.
- The winning bidder shall shoulder the cost incurred during hauling and unloading at the designated area of General Santos City Water District.
- The winning bidder is required to produce an additional one length for every size of PVC-O Pipe for the required testing specimen.
- The winning bidder is required to submit, from a third party, a Certificate of Analysis confirming the absence of metals such as lead, arsenic, cadmium, mercury, and chromium in the PVC-O pipes to be supplied prior to delivery.
- The winning bidder is required to provide plastic food wrap at both ends of the pipes.
- The Supplier is subject to the imposition of liquidated damages in case of delay in rendering its obligation until actual delivery.
- The Contractor shall pay liquidated damages to the Owner if he fails to complete the work within the time agreed upon. It is understood that said payment is not a penalty but a fixed sum representing the liquidated damages for each calendar day of delay.  
Computation of the said liquidated damages shall conform to the provision of RA 9184.



d) FLATTENING – The pipe shall no show evidence of splitting, cracking and breaking when flattened to a minimum of 40% of its outside diameter.

e) IMPACT TEST – Shall pass the minimum impact resistant of 157N-m @ 0°

-Based on  $g = 9.8 \text{ m./s}$

-Pipes shall be tested at high level H.

f) SHRINKAGE – Cut specimen will be subjected to oven test with 150 °C for a period of One (1) hour allowable shrinkage shall only be 5%

g) FIXED INTEGRAL GASKET- *type joints shall be used for all pipes sizes and shall be tested Using short term pressure – random sample shall be taken (1 meter strip) composed of a pipe with a hub (0.50m) and pipe nipple (0.50m) joined together with a standard elastomeric sealing ring and shall be subjected to a pressure load for at least 10 (Ten) hours without leak, the value of the pressure load test shall be 3.0 MPa at 20°.*

h) RESISTANCE TO INTERNAL PRESSURE –Pipe shall withstand, without bursting or leakage, the hydrostatic stress induced by internal hydrostatic pressure when tested in accordance with ISO 1167. The manufacturer shall Conduct test and furnish copy of the electronic result of their standard batch testing intended for the procuring Entity's delivery, in compliance with ISO 16422, The 20 ° Centigrade temperature at Circumferential stress of 2.6 MPa for 1000 hrs period to extrapolate the PVC-O life and guarantee its 50 years life, result should be certified by the manufacturer to be furnished and submit upon delivery of goods.

#### PVC-O PIPE SCHEDULE

Description	Quantity	Thickness (mm)	
315mmØ x 5.95m PVC-O ISO 16422 PN16, Fixed Seal	272 pcs	6.9	

Prepared by:

  
**MARIA CELIA N. DANDAN, CE**  
TWG Member

  
**MICHAEL G. GABALES, REE**  
TWG Head

Recommending Approval:

  
**ROGELIO A. BESANA JR. C.E., R.M.P**  
AGM-Operation & Technical Services

Approved:

  
**FRANCISCO R. ALOLOD, CPA, CESE**  
Acting General Manager A